Fertilizer & Pesticide Best Management Practices

Nutrient Best Management Practices

The Integrated Approach to Preventing Water Impairment

Nutrients have the potential to impair Montana's ground and surface waters. Improper management of fertilizers, manures, legumes, septic systems, and organic matter can lead to water degradation from nutrients. These nutrient sources are most likely to cause water contamination if the area has shallow ground water, course textured soils, high soil permeability, and active soil erosion processes. Nitrate leaching will also occur when there is excess water from precipitation or irrigation. The good news is that such pollution can be minimized through the use of nutrient best management practices.

Best Management Practices (BMPs) can be employed to reduce or eliminate nutrient movement. BMPs include nutrient control measures, operation or maintenance changes, and other techniques integrated into a total management system. These practices should be tailored to the site and cropping situation. The type of soil and climatic conditions, as well as how the land or crop is managed, will all influence what practices can be employed to reduce or eliminate the potential for water degradation.

Considerations for Nutrient Management

Nutrient management must be crop- and site-specific. The rate of nutrient application must be based on past experiences, research, and differences in soil, climate, management and soil test values. A soil test indicates nutrient availability and the supplying capacity of the soil. Other fertility characteristics (pH, organic matter, salts) are also determined through soil analysis. To account for seasonal variations, collect soil samples at approximately the same time each year. Soils should be retested as often as necessary to determine how cultural practices and crop production influence nutrient availability.

All sources of nitrogen–organic matter, fertilizer, manure, legumes, irrigation water and precipitation–must be considered in your nutrient management program. These potential sources of nitrogen must be taken into account when determining if and then how much additional to apply. Before adding nutrients, nutrient applicators should consider the effect on crop yield, profitability and product quality. Realistic yield potentials estimated from historical yields, stored soil water, and precipitation probabilities are used to determine optimum nitrogen application rates. The rate and placement of phosphorus is critical to safeguard surface water supplies. How the nutrient addition will impact soil productivity, organic matter and water quality should also be considered.

The rate of nitrogen fertilizer or manure application is the most important management practice affecting nitrate-nitrogen contributions to ground water. Ideally, you will want to apply the correct quantity at the best time and location possible, to ensure efficient use. Applications should be timed and placed to correspond with crop demand. Most crops demand greater amounts of nitrogen and phosphorus early in the growing season for vegetative production. Since the yield of many crops is determined during this early growth period, nutrient deficiencies will limit production. The greater the time between application and the crop's use of nitrogen, the greater the potential loss of nitrogen to ground water.

Cropping systems that increase soil organic matter promote more efficient use of nitrogen and also increase pesticide adsorption. Organic matter can be increased through intensive cropping, reducing summer fallow, integrating green manure and reducing tillage.

Best Management Practices

The following practices can be used to effectively manage nutrients. Often, because of the many factors that must be considered for a given field, the use of several practices will be necessary.

- ✓ Select a realistic yield potential that matches soil productivity with available water. Test your soils before fertilizing or planting. Consider conducting a soil test at the end of the growing season to fine-tune nitrogen management.

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- ✓ Take deep soil samples to determine residual nitrate-nitrogen.
- ✓ Probe the soil for stored soil moisture in the spring. If there is ample stored moisture, consider more intensive cropping (flexible cropping) rather than fallowing.
- ✓ Allow credits for nutrients from manure, sludge, organic matter, irrigation water and legumes.
    - Take a sample of manure or sludge and have it analyzed for nutrient content. Account for losses during storage and from handling and spreading.
    - Base the application rate on a soil test and include the mineralization rate of the manure or sludge.
    - Consider applying nutrients throughout the year to avoid storage losses and improve crop nutrient use. Apply uniformly by mixing as much as practical and by using good calibrated equipment. Inject or incorporate promptly after mixing.
    - Don't apply on steep slopes during rainy weather and avoid spreading manure on frozen ground with steep slopes. On sandy soils, apply organic materials as soon as possible before planting in order to minimize leaching.
- ✓ Apply only as much nitrogen and phosphorus as required based on a soil test, the crop, yield potential and management intensity.
- ✓ Consider the site's soil texture, water holding capacity, slope and other features that could increase the nitrogen leaching and phosphorus runoff potential.
- ✓ Plan nitrogen applications to correspond with crop demand. Consider splitting nitrogen applications, nitrogen sources, and the use of nitrification inhibitors.
- ✓ Incorporate plant nitrate tissue testing to "spoon-feed" nitrogen to the crop.
- ✓ Consider applying fertilizer at variable rates to match varying residual fertility levels and yield potentials, rather than a uniform rate for the whole field.
- ✓ Don't apply nitrogen in the fall on coarse-textured or shallow soils or over fractured bedrock.
- ✓ Band or broadcast/incorporate phosphorus to avoid erosion losses.
- ✓ Properly calibrate equipment to apply the desired amount of fertilizer or manure.
- ✓ Manage fertigation systems carefully.
- ✓ Schedule irrigation to minimize leaching. Where applicable, use contour tillage, diversions, terraces, sediment ponds and other methods to trap runoff.
- ✓ Diversify crop rotations to include crops that utilize residual nitrogen and store soil water, particularly at deeper depths.
- ✓ Blend and store fertilizers and other nutrients away from water sources.
- ✓ Consider vegetative buffer strips to separate cropped areas from streams, lakes and other environmentally sensitive areas.
- ✓ Control soil erosion and run-off of nutrients, particularly phosphorus, by properly managing crop residues and maintaining vegetation on ditch banks and in drainage channels. Slope roads toward fields and consider permanent plant cover on roads. Use windbreaks and conservation tillage to control wind erosion.

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